Vision for a Decision Support System for California State Government Water Resources Funding Decisions

Definition of Decision Support System

"Abbreviated *DSS*, the term refers to an interactive computerized system that gathers and presents data from a wide range of sources, typically for business purposes. DSS applications are systems and subsystems that help people make decisions based on data that is culled from a wide range of sources."

Webopedia.com

Definition of Vision

"…

3. the ability or an instance of great perception, esp of future developments: *a man of vision*

4. a mystical or religious experience of seeing some supernatural event, person, etc: *the vision of St John of the Cross*

…"

World English Dictionary

Objectives of Presentation

- Present a Conceptual Framework for a DSS that would Inform State Government Funding Decisions
- Show Relevance to the Update 2013 Finance Plan
- Begin a Dialog on the Advisability and Feasibility of Developing a DSS
  - Opportunity for gaining increased knowledge about trade-offs vs. DSS tool investment cost (e.g., gains from tool complexity vs. diminishing returns)
  - Availability of existing data and models
  - Prospect for developing additional data and models needed for a successful DSS tool

Relevance to Update 2013 Finance Plan

- DSS can incorporate, analyze and inform Storyboard Components 1, 2, 5, and 8
  - Scope and Outcomes
  - The ability of IWM activities to meet objectives
  - The appropriate role for state government investment
  - Trade-offs
- DSS can accomplish much of the Finance Plan future work as identified by staff and stakeholders
  - Standardization of Methods, Information and Estimates
  - Identification of Diminishing Returns
  - Co-Dependence of IWM Activities (i.e. need for systemic analysis)
  - Assigning Economic Value to Environmental Assets and Services
  - Time Scale and Adaptive Management

Relevance to Update 2013 Finance Plan

- Pilot-level DSS can be developed for illustrative purposes for Water Plan Update 2013

- More complete work for subsequent Water Plan Updates can take advantage of future improvements in system modeling capability and data availability

General Approach

- Develop a statewide analysis framework to quantitatively analyze and identify trade-offs associated with adopting alternative State and regional response packages, and use information about those trade-offs to support informed State investment decisions

- Within the statewide framework, develop regional analysis frameworks that utilize existing water system simulation models and data to the extent possible

General Approach

- Use those regional frameworks to integrate economic, environmental, and social benefits quantification tools, recognizing that different regions may have different quantification tools based on the suitability of those tools for each region

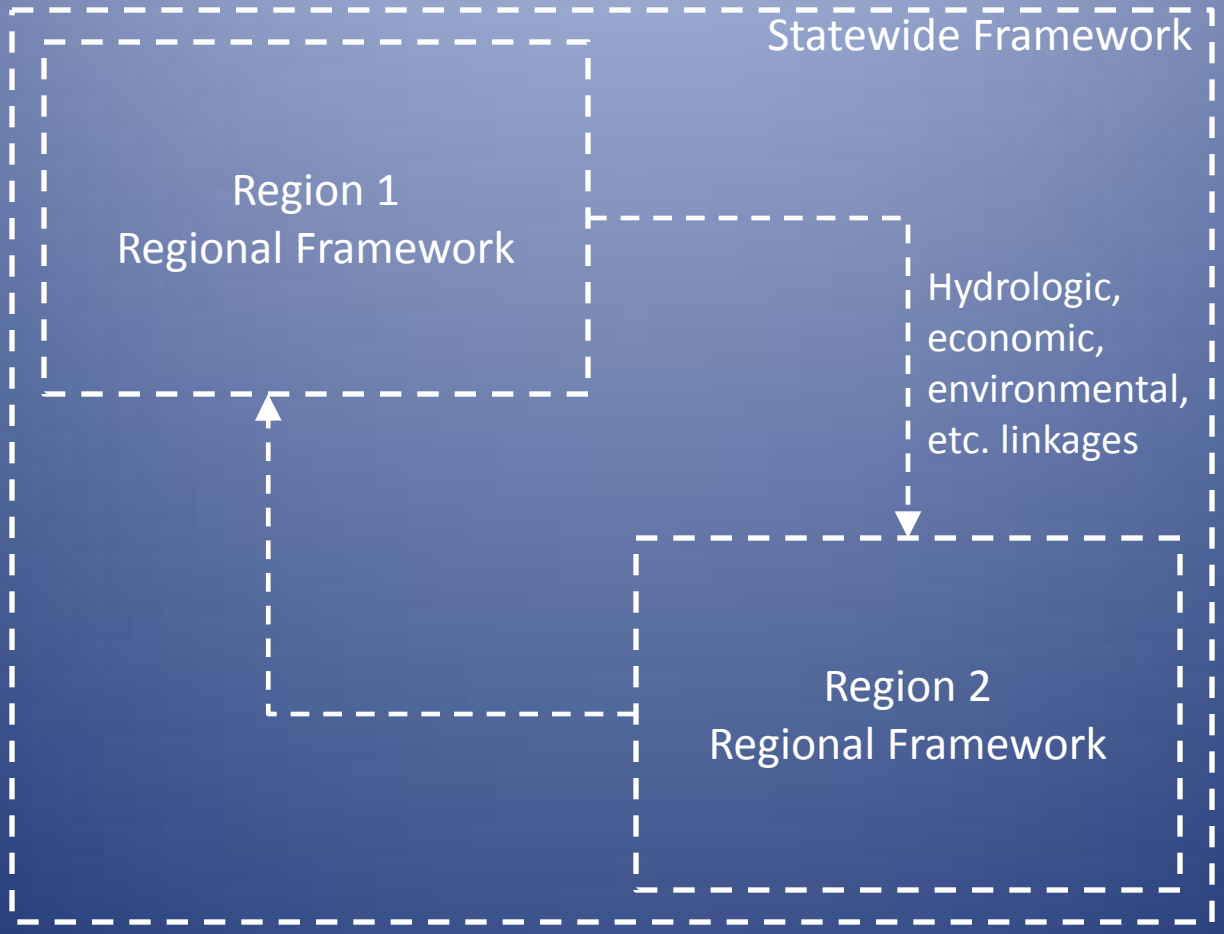
- Link the regional analysis frameworks with existing water system simulation models and data to the extent possible

General Approach

- Work to attain consensus on the appropriate DSS framework structure, models, and model use by working closely with local and regional agencies and other stakeholders (Shared Vision Planning)

- Realize that the DSS framework tool is only for comparative analyses of alternative response packages to identify trade-offs for planning purposes, not to forecast outcome levels (i.e., relative changes between alternatives)

DSS Framework Structure



DSS Framework

- Response Package Objectives (overlapping, possibly conflicting)
  - Statewide (identify opportunities for obtaining and/or facilitating public benefits)
  - Regional (identify opportunities for obtaining regional benefits)
  - Local
- Metrics (informed by sustainability indicators work)
  - Physical (flows, temperature, etc)
  - Environmental (acres of habitat, species diversity, etc)
  - Economic (market and non-market values)
  - Social (cultural resources, environmental justice, etc)

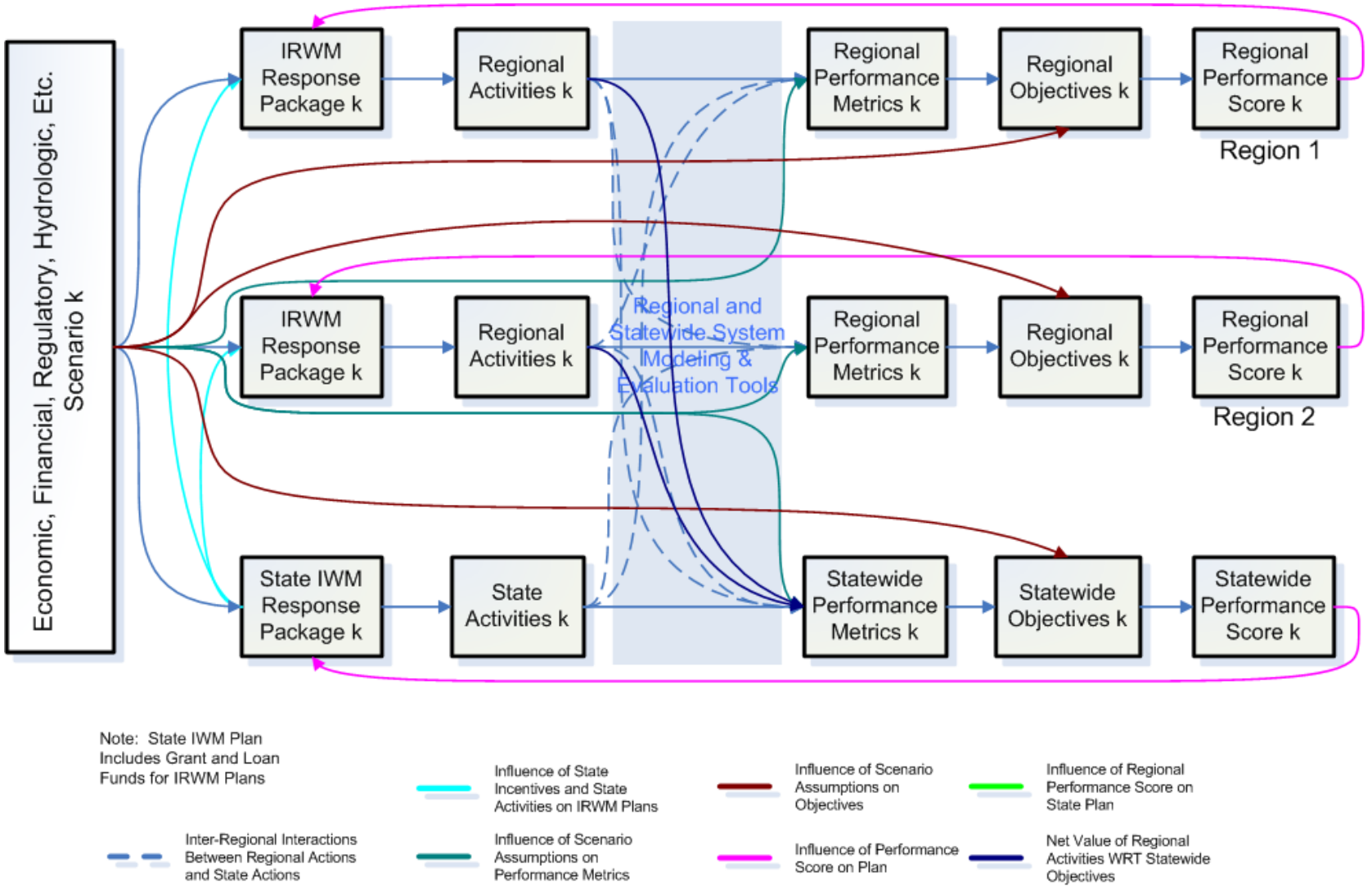
DSS Framework

- Examples of Analysis/Evaluation Techniques
  - Complex mathematical systems models
  - Ranking scale methods
  - Communications with decision makers & other stakeholders
- Examples of Existing Analysis Tools
  - Hydrologic project operations models
  - Fish survival models
  - Water quality models
  - Ecological assessment models (e.g., annual habitat units)
  - Urban and agricultural economic reliability benefits models
  - Flood damage models

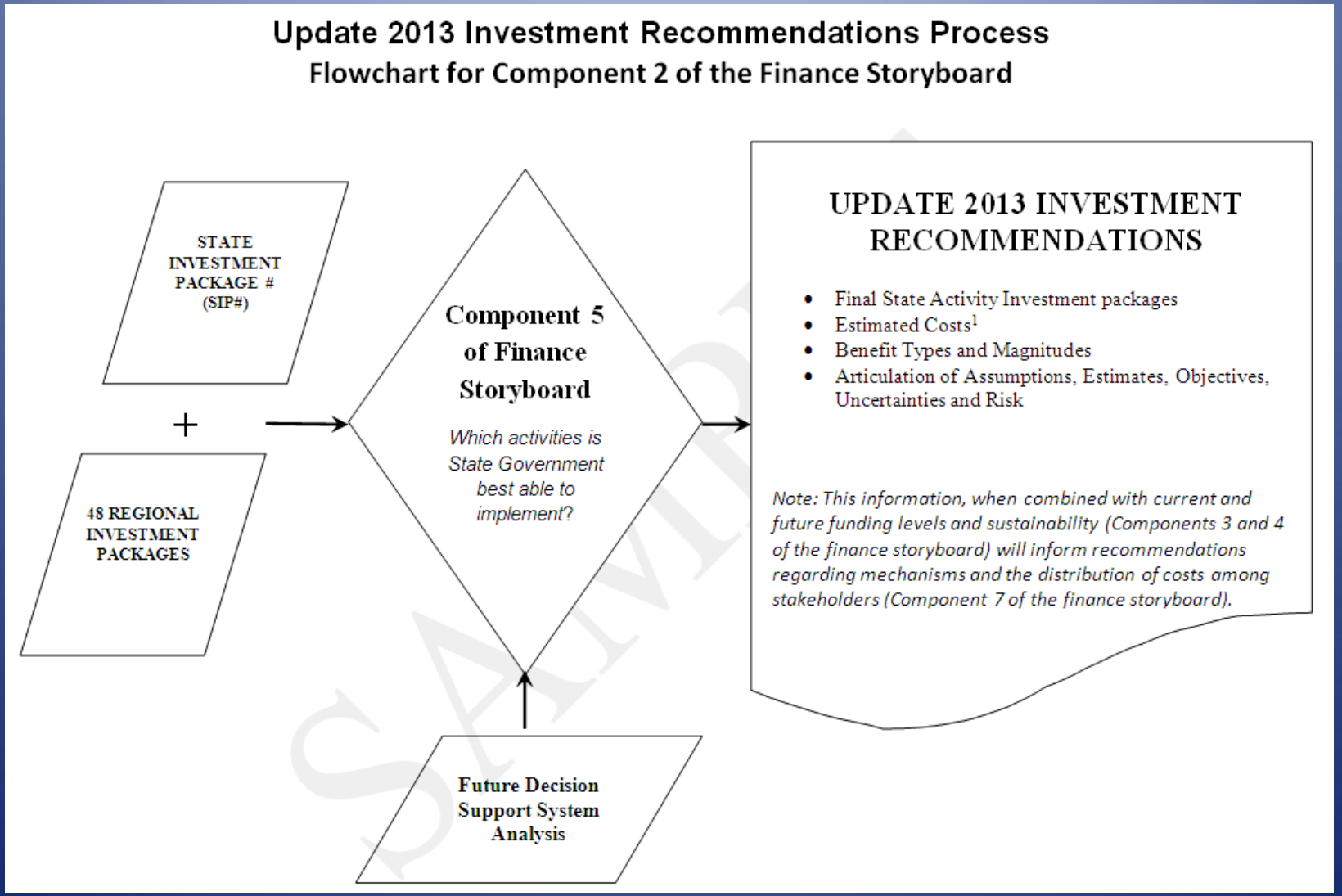
DSS Framework

- Proposed DSS Framework Logic Flow
  - Direct and indirect relationships
    - Hydrologic
    - Environmental effects
    - Socio-economic benefits and costs
    - Decision making (policy linkages)
  - Example performance scores
    - Water service system reliability
    - Environmental sustainability
    - Net economic benefits
    - Social welfare benefits

DSS Framework Logic



DSS Framework



Advantages of the DSS Framework

- Commonality of analysis techniques
- Identification of opportunities for higher-level integration
- Ability to identify and quantify trade-offs using consistent methods
- Insights gained from the development effort (e.g., where best to invest in model and data development)
- Credibility of benefits quantification for grant applications

DSS Framework Hurdles

- Gaps in Existing Models
  - Agency/Geographic coverage
  - Missing analysis aspects (economic, environmental, etc.)
- Gaps in Existing Data
- Inconsistency Problems in Linking Models
  - Time step
  - Period of analysis
  - Output/Input mismatch

Examples of Existing Water System Simulation Software

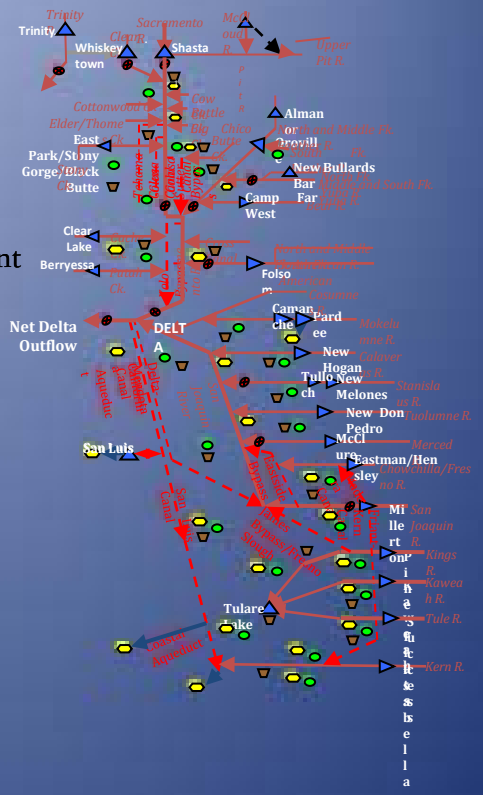
- Stockholm Institute Water Evaluation and Planning Model (WEAP)
- DWR Water Resource Integrated Modeling System (WRIMS)
- MWDSC Integrated Regional Planning Simulation Model (IRPSIM)
- USACE Hydrologic Engineering Centers River Analysis System (HEC-RAS)
- Metropolitan Water District of Southern California Integrated Regional Planning Simulation Model (IRPSIM)
- General System Simulation Software (GoldSim, Powersim, AnyLogic, Vensim, Extend, etc.)

Examples of Integrated Modeling Systems Existing or in Development

- 2013 CWP Response Package Analysis Model (WEAP)
- CALSIM II SWP and CVP Project Operations (WRIMS, DSM2)
- CALFED Common Assumptions Model Package (CALSIM, LCPSIM, SWAP, LCRBWQM, SALMOD)
- Inland Empire Utilities Agency RDM Model (WEAP)
- CVP IRP Analysis Framework (WEAP, CALLITE, DSM2, LCPSIM, SWAP, SRWQM, LTGEN, DWR_Power)
- UCD Statewide Economic-Engineering Water Model – CALVIN (HEC-RAS, SWAP)
- SCVWD Operations Model (WEAP)
- MWDSC IRP Model (IRPSIM)
- SWP Contractor IRP Models (Augmented IRPSIM)

WEAP and the State Water Plan

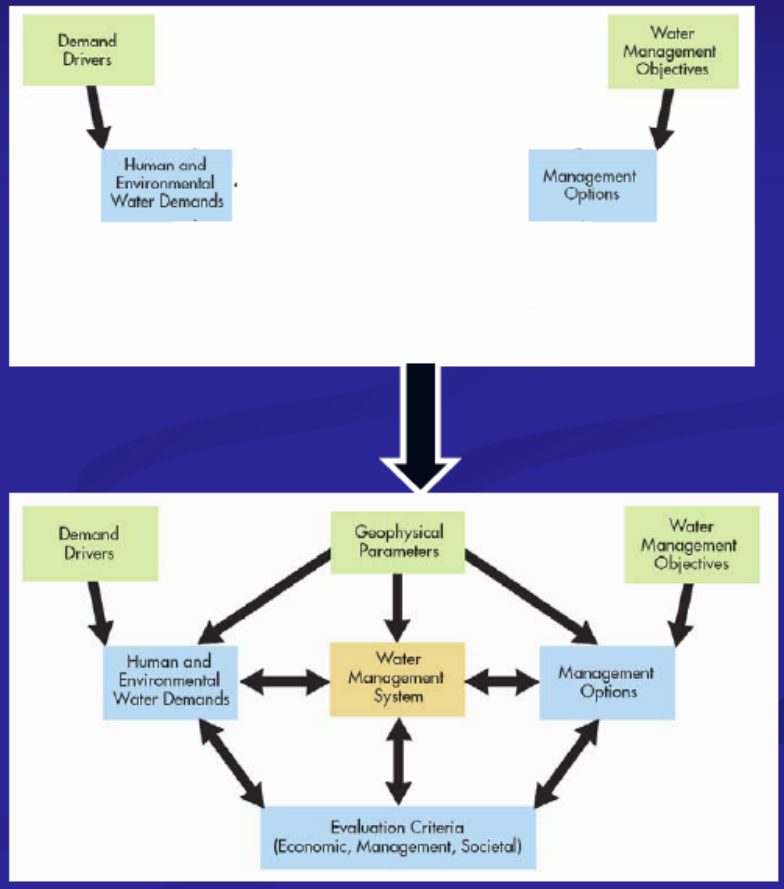
Interactive Groundwater
Irrigated Agriculture
Rivers and Tributaries
Inter-Basin Transfer
Canals and Diversions
Reservoir
M&I/Environ. Demand
Instream Flow Requirement



Supporting the Inyo-Mono IRWMP Process though the Development of Analytical Tools, Power Point Presentation, David Purkey, Stockholm Environment Institute

CWP Update 2009 Seeks To Build On 2005 Analysis

- Expand scenarios to consider
  - water supply
  - climate change
  - water quality
  - flood issues
- Refine scenario narratives
- Support the evaluation of response packages against scenarios



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CWP WEAP Response Package Analysis

External Factors	Resource Management Strategies
Population Climatic conditions	Strategies that: •Reduce water demand •Improve operational flexibility & transfers •Increase water supply •Practice resource stewardship •Improve water quality •Improve flood management
Analytical Tools	**Sample Performance Measures**
Water Evaluation and Planning (WEAP) model Planning Area scale for Central Valley Regions	•Supply Reliability (Urban & Agriculture) •Environmental flows •Groundwater levels •Strategy cost

RAND Inland Empire Utilities Agency (IEUA) Study

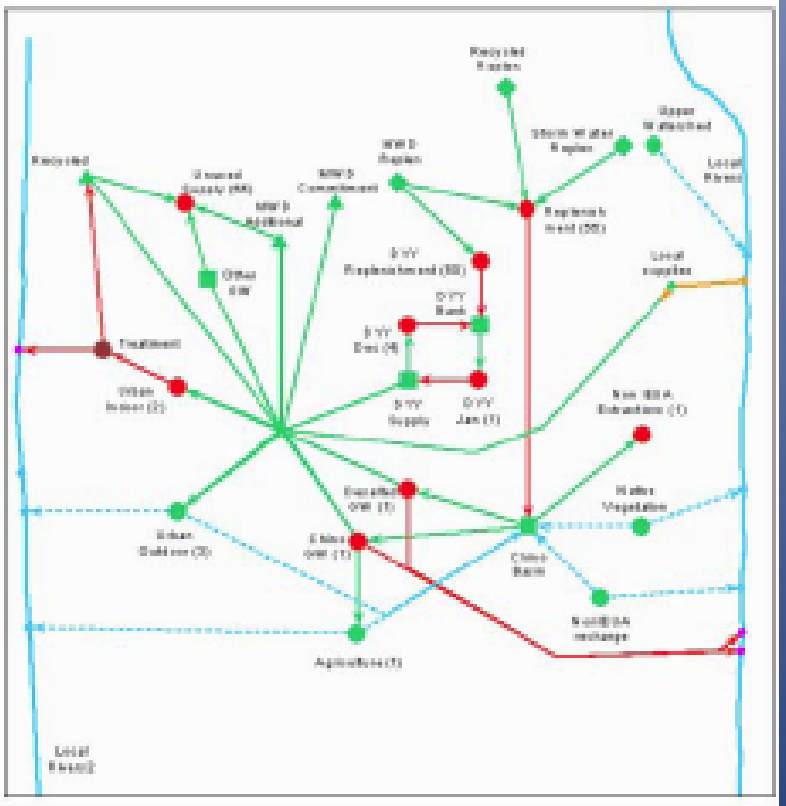
WEAP Model Represents Major Elements of the IEUA Region's Water-Management System

Sources
- Precipitation over catchments
- Imports from MWD
- Non-Chino Basin groundwater

Demands
- Urban indoor
- Urban outdoor
- Agricultural

Chino Groundwater Basin
- Direct use
- Desalted
- Replenishment
- DYY program

Recycling
- Direct Use
- Replenishment



Preparing for an Uncertain Future Climate in the Inland Empire, RAND, 2008

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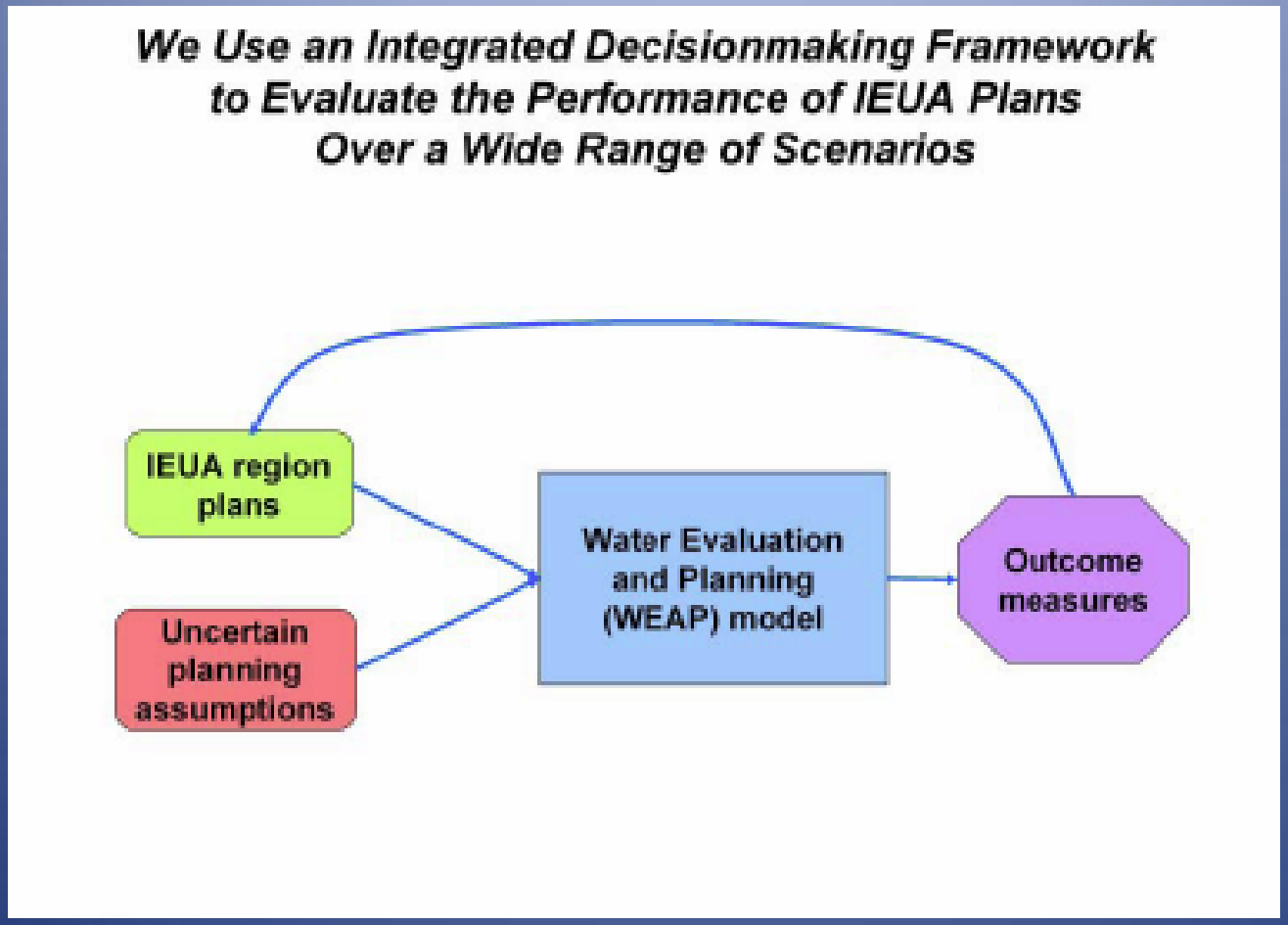

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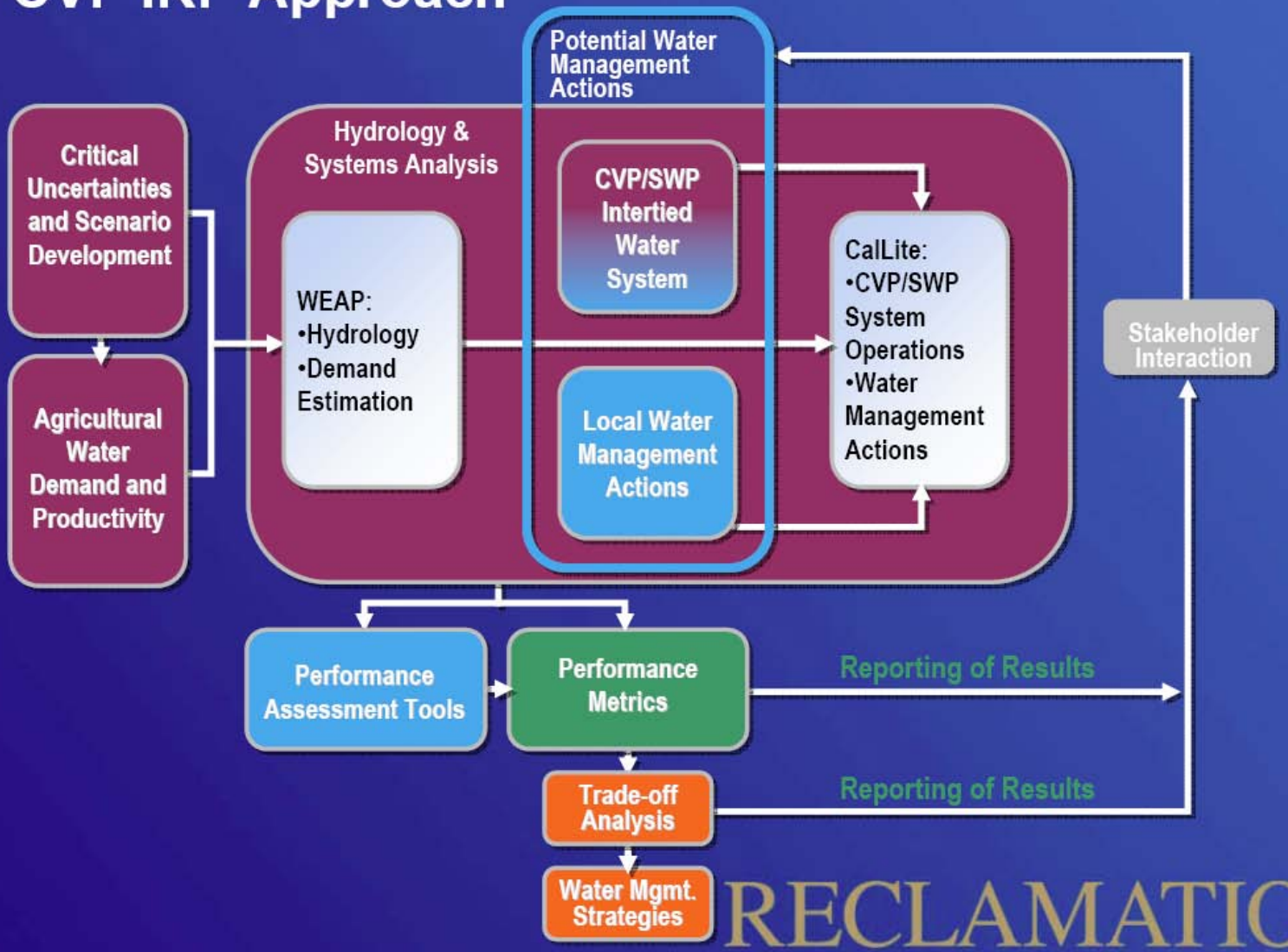
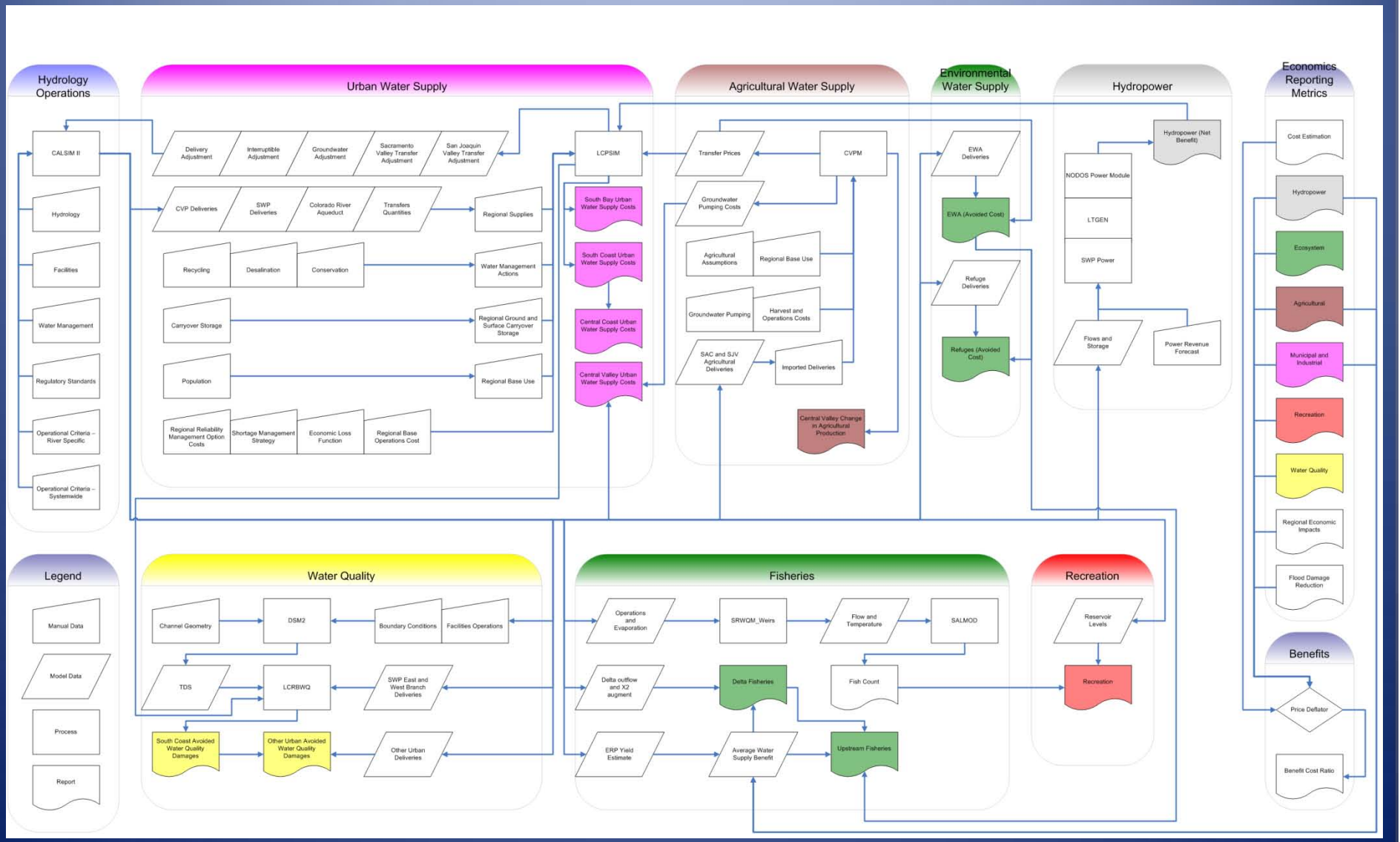
CVP IRP Approach

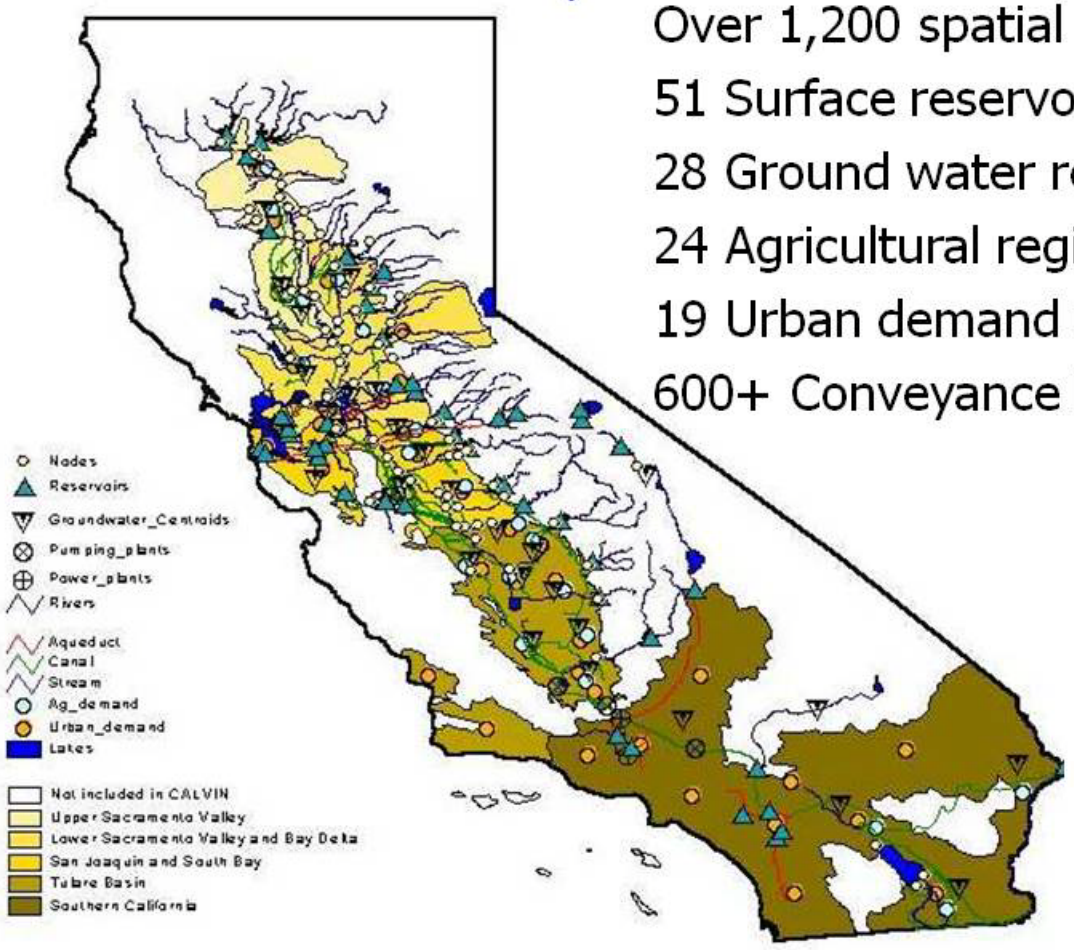


CALFED Common Model Package



UC Davis CALVIN Model

CALVIN's Spatial Coverage



Over 1,200 spatial elements

51 Surface reservoirs

28 Ground water reservoirs

24 Agricultural regions

19 Urban demand regions

600+ Conveyance Links

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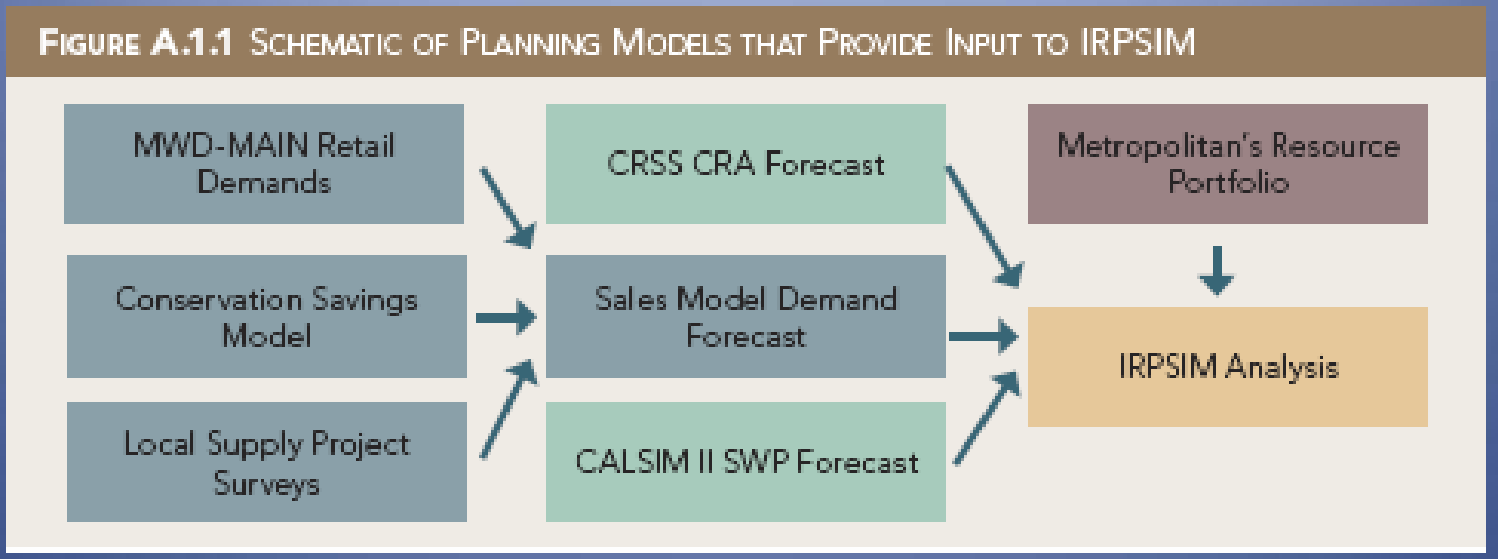
Slide 10, Climate Change Workshop Presentation, February 20, 2003

MWDSC IRPSIM Model

FIGURE A.1.1 SCHEMATIC OF PLANNING MODELS THAT PROVIDE INPUT TO IRPSIM



"IRPSIM is Metropolitan's primary tool for evaluating the region's future water supply reliability. The IRPSIM model integrates projections of demands, conservation, imported supplies, and storage to determine future reliability under a range of resource management strategies."

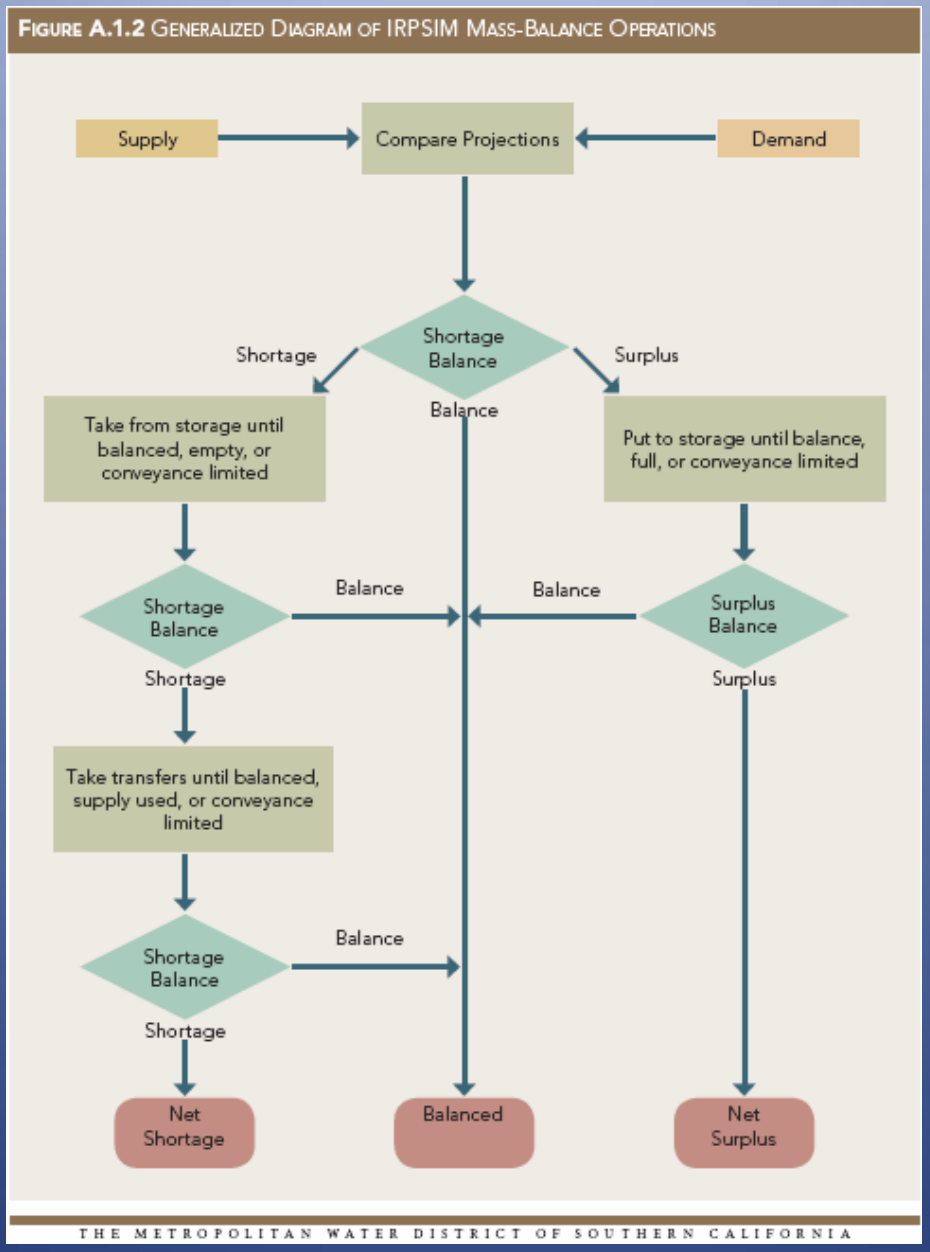
Appendix, Integrated Water Resources Plan 2010 Update, MWDSC

MWDSC & SWP Contractor IRPSIM Models

Among the operations Included in MWDSC Model:

- 5 Regional reservoirs
- 10 Regional conjunctive use operations
- 5 SWP banking operations
- 3 CR banking operations

(8k variables)



Note: SWP contractor IRPSIM models are augmented with an economic loss function

Appendix, Integrated Water Resources Plan 2010 Update, MWDSC

Questions for Future Finance Caucus Discussion

- What else should be included in this proposed DSS framework in order to speak to your interests?
- What other existing models have potential for informing State IWM investment priorities?

Next Steps

- Engage SWAN as a technical resource and the Finance Caucus as a policy resource
- Develop a pilot regional DSS framework, building on the Water Plan WEAP response package evaluation work